

same bounds, as they were wont to be in his time." As was previously observed, the reclaiming of the immense marshes to the north and south of the Thames was anterior to all our authentic records. But it appears that the first commission of sewers issued in England for the express purpose of viewing and repairing these embankments, of which our public records take notice, was in the year 1295, 22nd Edward I. This commission was directed to his beloved and faithful, John de Maittingham, and William de Carleton, who were authorized to view the banks, ditches, gutters, sewers, &c., and repair the same between Lambeth and Greenwich: and about three years afterwards, through the neglect of maintaining the banks at Rotherhithe, considerable breaches were made in them by the violence of the tides, such that a great part of the adjacent marshes was inundated. From time to time other commissions were issued for the repair of the embankments betwixt Lambeth and Greenwich. In the year 1329, 13th Edward II., John Abell, and John de Everdon, were appointed to view the said banks, and to supply speedily remedy for their repair; and six years afterwards another breach took place in those banks, which occasioned great damage in the neighbourhood.

Commissioners were also appointed to view and take order for the reparation of the banks, ditches, &c., for the protection of the marshes lying between Dartford, Woolwich, and Greenwich, the first mention of which occurs A.D. 1324, 8th Edward II., John Abell and John de Hartnole being appointed commissioners to view and repair these banks; and early in the following year another commission was issued for the protection of the same banks and marshes. Six years after, from the violence of the tides, a considerable breach was made in the bank between Greenwich and Woolwich. Commissioners continued to be appointed from time to time for the purpose of maintaining and repairing these banks. In the year 1341, 15th Edward III., Robert de Sadlington, Thomas de Blaston, and Gervase de Wilford, were the first appointed commissioners to view and order the repair of the banks on the north side of the river between a place called the Next and Temple Bar, within the precincts of Westminster and the parts adjacent, the said banks having become broken and decayed by the force and violence of the tides. Concerning the extensive marshes of Essex, the first mention of them is in King John's time, Roger de Gramnivill being then attached to show cause why he did not stand to the determination made in the said King's Court, by a fine with the prior of St. John of Jerusalem, touching the banks, gutters, and ditches to be repaired in those marshes.

In ancient times the conservancy of the river Thames was most strictly attended to, and our forefathers were very jealous of maintaining and preserving the purity of the Thames water; and an intent were the authorities of old times in preventing the river from becoming contaminated by any foreign or noxious matters, that in order to preserve its purity, many enactments were made by Parliament, as well as orders by the Common Council of the City of London, in pursuance of those enactments. In the sixteenth year of the reign of Richard II., A.D. 1392, it was enacted, "that no person do throw, or cause to be thrown, or laid, any filth, or ordure, muck, rubbish, or laystake, in the said water of Thames, of the one side or the other, between the Palace of Westminster and the Tower of London, on pain of the forfeiture of 10*l*.; and butchers or others are prohibited from casting entrails, &c. into the river, on penalty of 40*l*." An Act of Parliament was also passed in the twenty-seventh year of the reign of Henry VIII., A.D. 1535, in which it was enacted, "that if any person or persons do, or procure any thing to be done, in the annoying of the stream of the river of Thames, by casting of dung, or rubbish, or other thing into the said river, he shall forfeit for so offending the sum of 100 shillings."

During the period of nearly two centuries, the bed of the river has always afforded an abundant supply of most excellent sand and gravel. The sand from this source has always been preferred by builders, and has been and is now being procured with much avidity, in consequence of its sharpness and cleanness, which are the most essential properties in the

composition of mortar. From the bed of the river considerable quantities of gravel have also been and are now being procured for the purpose of forming the modern composition of concrete, and for ballasting very many of the numerous outward-bound shipping. In order to supply the demands for these materials, and for the purpose of removing shelves or accumulations which obstructed the channel, a system of constant dredging has been going on during this period, and this has had great influence in making and maintaining a more uniform and much deeper channel. In pursuance of the last-mentioned enactment of Parliament, the Common Council of the city of London, during the year 1667, first issued an order allowing and authorizing any "person or persons to dig, carry away, and take away sand, gravel, or any rubbish, earth, or any thing lying and being in any shelf or shelves within the said river of Thames, without lett or interruption of any person or persons, and without any thing paying for the same, and after that to sell the same away, or otherwise occupy or dispose of the said gravel, sand, or other thing, at their free liberty and pleasure." And moreover, with reference to the jurisdiction which the city authorities exercised over the city and the ground adjacent, they also ordered "that all paviours, bricklayers, tilers, masons, and all others that occupy sand or gravel, shall endeavour themselves with all diligence to occupy the said sand or gravel, and none other, paying for the same reasonably, as they should or ought to pay for other sand or gravel digged out of other men's grounds about the said city, which after is filled again with much filthy things, to the great infection of the inhabitants of the said city, and all others repairing to the same." The noble and majestic river Thames, running east and west through what may now be called the middle of London, and whose waters were formerly of a pure and pellucid character, is now the *Canal Marina* or main drain of London, as the stream after passing Putney-bridge becomes loaded and contaminated with the outpouring filth discharged from the various sewers.

It appears that through the apathy of the constituted bodies under whose care the conservancy of the river Thames was subsequently placed, very many encroachments upon the channel, on both banks by the advancement of the wharf lines, were permitted from time to time by those bodies. The encroachments were, with few exceptions, never formed with a view to the improvement of the navigation of the river, and in consequence many of the projections that were thrown out into the stream formed direct obstructions to the passing currents, which reflected their motions, produced eddies, deposits, and accumulations of mud and silt at the sides, as well as shoals of sand and gravel upon the bed.

While the flowing of the tides up the river Thames was left to their own undeviating course, and before any obstructions were formed, either by embankments or otherwise, the channel of the river must have been considerably shallower than it is at present, for the various embankments must have had considerable influence in deepening the channel to which the flowing of the river was confined, the contraction of the stream producing a greater velocity, and consequently an increased scour upon its bed. That the river was anciently much shallower than at present is evident from the numerous fords which existed, where persons could cross from one side to the opposite on foot as well as on horseback at the time of low water, whence the Horseferry, by Lambeth Palace, takes its name; and Maitland says that he discovered an ancient ford "about 90 feet west of the south-west angle of Chelsea College Garden, and at low water it was only 4 feet 7 inches deep;" and in consequence of the strong winds downwards the previous day the water was not so deep by a foot; and he also says that, "it is probable that at such tides, before the course of the river was obstructed, either by banks or bridges, it must have been considerably shallower."

The learned and indefatigable Camden in his "Britannia" says, "that the Thames receives the tide about 60 Italian miles from the mouth. And there's no other river in Europe that I know of, where the tide comes up so many miles, to the great advantage of those that live by it. Whether it be, that from this place (Shene) there

are hardly any crooking, but 'tis carried eastward in a more direct channel, generally fenced with higher banks, and opens a wider mouth than other rivers to let in the sea." But since the removal of old London-bridge the tide has risen much higher and runs upwards to a farther distance, in consequence of the increased velocity imparted to the flood, which causes a greater quantity of water to flow in the same time.

Although the surfaces of the streets and roads of the whole of London have been artificially raised and will of necessity be getting higher, still a considerable portion of the lower part of Westminster, Wapping, and the whole of Lambeth, Southwark, Bermondsey, and Rotherhithe, are now under high-tide level. These places are protected from inundation by the embankments, and by the flaps to the mouths of the sewers; hence the great importance of maintaining such defences, and of keeping them in good repair. But there are times, especially at spring tides assisted by strong north east winds, when the embankments are overflowed, inundating the streets, premises, and cellars, to the great detriment and annoyance of the inhabitants.

Hence a question arises as to what effect the contemplated embankment of the river Thames may have by the abstraction of water-space in raising the high-tide level above its present height. The momentum of the tidal wave flowing up the channel of any river receives a considerable check, which is proportional to the activity of the channel. Immediately that the tidal wave arrives at and enters the river, the issue of the ebb is in consequence restrained and forced backwards. The check it receives continues to operate upon the discharge from the mouth of the river upwards to the highest point of the reach of the tide; for the tidal wave in meeting and striking the downward current of the river water causes a retardation of both streams, and, in consequence, a rising of the waters is produced. A contracted channel accelerates the velocity of both the flood and ebb tides, and in proportion as the momentum of the one strikes that of the other, the height of the water will increase and will be dependant; for whatever produces a retardation of the natural velocity of a running stream, either from the cause already suggested, or the irregularities and resistance of the channel, has a considerable tendency to augment the height of the stream. The force of the efflux of the river water running through a contracted channel is sometimes such, that its momentum is much greater than that of the downing tide; therefore, during freshes the former may be running along the channel in the direction of the discharge, while the latter, being reflected and checked by the superior power, flows imperceptibly on the top; and the narrowed section may be the means of causing the rise to be somewhat higher than the natural elevation of high-water from the tide alone. The surface of high-water in a river is always much higher upwards than the natural elevation in the open sea, the increased rise being assisted by the shelving shores, the activity of the channel, and the pent-up river water.

The velocity and motive power of the water of both the flood and ebb, all along their course, should be as equable and regular as possible; but in order to produce a scouring action on the bed, the longer the duration of ebb-tide lasts beyond that of the flood, the greater will be the prevention of accumulation of silt and mud. The extension of the ebb beyond the duration of the flood in the Thames is produced by the flood-tide ponding back the river waters. The matter held in suspension by the water of tides is nearly in a constant state of oscillation, and the scour of many ebbs is necessary before the debris discharged into the river can find its way to the sea. Nearly the same quantity of matter carried downwards is forced up again with the return of flood, but not to the same distance, so that it gradually works downwards, and thus the discharge of ebb ultimately carries it out to sea. The conjoint force and action of the back-water in combination with the river water, more especially during freshes, have a greater mechanical effect as a means of scour when the channel is fixed and limited in its transverse section. But the limit to compression should not interfere with the admittance of a sufficient body of tidal water upwards, for the purpose of